

# Resting energy expenditure, substrate use, and video tapes

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## Abstract

**Objective**—To investigate the effect of watching different types of video on energy expenditure.

**Design**—Randomised study assessing a “pleasant,” an “amusing,” an “exciting,” and no video film clips.

**Subjects**—12 volunteers who did not know the purpose of the study.

**Main outcome measures**—Changes in energy expenditure, substrate use, heart rate, and aural temperature during each film clip.

**Results**—Energy expenditure was raised slightly (0.21 kJ/day) during the “exciting” film. Individual responses varied greatly.

**Conclusion**—Watching different types of video seems to have little effect on resting metabolic rate.

## Introduction

As you lie, relaxed, “off duty” in front of the television, full of seasonal fayre and good will to all men (and budget holders), there can be no harm in watching some of those films you recorded on video and always meant to watch. You luxuriate in the temporary lack of responsibility and in the warm glow of postprandial thermogenesis, watching “the best film since . . . his last one.” But have you ever considered how much energy you are burning in comparison with sitting quietly reading or doing the crossword? Can the type of film you watch increase your metabolic rate? Will watching *The Sound of Music* cause you to get rid of Christmas dinner quicker than watching *Raiders of the Lost Ark*? How many times after watching a particularly exciting car chase, tense thriller, or stimulating sporting event have you felt exhausted and drained and in need of a snack?

Resting metabolic rate has to be measured in standardised conditions. Subjects must fast overnight, be in a quiet, thermostable environment, and be relaxed and rested for at least 30 minutes before measurements start.<sup>1</sup> Research centres now commonly “entertain and distract” subjects during metabolic studies with recorded films on video. No evaluation seems to have been published of whether the type of film and the emotions it may arouse can perceptibly alter the results of calorimetry.

We report a controlled study of the effect of watching different films on measurements of energy expenditure, substrate utilisation (indirect calorimetry), heart rate, and body temperature. Body temperature and heart rate were used as crude indices of catecholamine release, which is an indicator of arousal.

## Subjects and methods

Twelve subjects (age range 18–45; six women) fasted overnight (12 hours) and attended the metabolic unit at 8 am. After having an ear probe thermometer and electrocardiograph leads attached they rested recumbent in a darkened, quiet, thermostable room for 30 minutes. They did not know the purpose of the study but were told that they were “control subjects for another study measuring resting metabolic rate.” The studies were approved by the Newcastle Health



Watching “Blackadder” won’t help with weight loss

Authority and University of Newcastle upon Tyne joint ethics committee.

After the rest period, indirect calorimetry was carried out for 50 minutes. Continuous measurements were made with an open hood system (Deltatrac Metabolic Monitor, Datex, Helsinki).<sup>2</sup> Aural temperature was measured with a thermocouple (Ellab CTD 85, Copenhagen) and heart rate with a standard three lead electrocardiograph (S&W Vickers, Sidcup).

Subjects watched 10 minute clips from three films, and the video screen blank for 10 minutes. There was a two minute gap (wash out) between each sequence. These films were categorised as “pleasant” *Death on the Nile*, EMI Films, Reading; “exciting” *Alien*, CBS FOX Video, Greenford; and “amusing” *Blackadder Goes Forth—Private Plane*, BBC Enterprises, London. During 10 minutes of calorimetry at rest, only a test signal was shown. We obtained permission from the relevant film distribution companies, and the hospital had a valid public broadcast licence at the time of the study.

Subjects were randomised to receive a sequence from a four period Williams crossover design. For convenience, four video tapes were recorded with the film clips in four sequences defined by the design and shown without interruption. The sample size was based on a within subject coefficient of variation of the respiratory exchange ratio (carbon dioxide production/oxygen uptake) of 5% and a power of 80% to detect a difference of 0.05 between respiratory exchange ratio means with a type I error rate of 5%.

The data were analysed in a statistical model that allowed for differences between subjects and the order in which the film clip was seen. In addition to estimating the direct effect of the videos, the model included a term for the possible carryover of the video effects. Overall levels of oxygen uptake, carbon dioxide production, respiratory exchange ratio, and energy expenditure were summarised as means of minute to minute values. To summarise fluctuations in measurements caused by watching the videos, the logarithms of the standard deviation of the responses were also analysed. Body temperature and heart rate were analysed in the same way.

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## Results

Table I shows no evidence of a difference in the subjects' mean respiratory exchange ratio when watching the three videos or the blank video ( $F_{3,27}=0.43$ ,  $P=0.73$ ). The log of the standard deviation of the response within each video showed no significant differences ( $F_{3,27}=1.38$ ,  $P=0.27$ ). Geometric means of the standard deviations of the responses within each video are shown in table II.

Energy expenditure was no different between videos ( $F_{3,27}=1.58$ ,  $P=0.22$ ) but the mean expenditure while watching the exciting video was higher than for the blank video. The log standard deviation of energy expenditure did not differ between the videos ( $F_{3,27}=1.95$ ,  $P=0.15$ ).

Energy expenditure during the "exciting" video varied among individuals, with eight of the 12 subjects showing an increased energy expenditure. Neither heart rate nor aural temperature showed overall significant changes between videos. Changes in heart rate to

the "exciting" film ranged from no change to a rise of 34 beats/min within a minute. There was no difference in responses between men and women.

## Discussion

Overall there were no significant changes in mean values of energy expenditure, heart rate, or body temperature during the different film clips. The difference in energy expenditure between the blank and the exciting film clip may just be chance since numerous analyses were performed. Nevertheless, during the first five minutes of the exciting clip there was a noticeable surge in the energy expenditure trace in eight out of the 12 subjects. This coincided with the gruesome scene in *Alien* in which the creature violently bursts out of John Hurt's abdomen and scuttles across the floor. None of the other clips showed such a consistent response in subjects. Heart rate responses to this scene varied widely.

The mean change from basal in energy expenditure of 209 kJ/day is the equivalent in energy terms of a handful of sweetened popcorn and therefore cannot be recommended as a reliable method of losing weight. Indeed, responding to the call of the exercise bike, jogging kit, and taking the dog for a walk is still the only sure way of meaningfully raising energy expenditure to counteract the seasonal weight gain.

The lack of significant change in heart rate and aural temperature in the group suggests that these are not sensitive measures of catecholamine release. This work has shown that watching videos during indirect calorimetry has little effect on the average measurements provided that measurements are continued for long enough (> 20 minutes).

We thank the participants, the video distribution companies for permission to use their films, and Messrs Horton and Vaziri of Express Video, Gosforth, Newcastle upon Tyne, for the loan of the video tapes.

- 1 Consolazio CF, Johnson RE, Pecora LJ. Respiratory metabolism. In: *Physiological measurements of metabolic functions in man*. New York: McGraw Hill, 1963:1-59.
- 2 Cooper BG, McLean JA, Taylor R. Evaluation of the Datex Deltatrac indirect calorimetry by gravimetric gas injection and alcohol burning. *Clin Phys Physiol Meas* 1991;12:333-41.

**Table 1—Mean respiratory exchange ratio and energy expenditure while watching videos**

Video	Respiratory exchange ratio		Energy expenditure (kJ/day)	
	Mean	Difference (95% confidence interval)	Mean	Difference (95% confidence interval)
Blank	0.855		5619	
Pleasant	0.857	0.0019 (-0.0517 to 0.055)	5723	107 (-101 to 315)
Exciting	0.877	0.0217 (-0.0314 to 0.075)	5837	217 (8 to 425)
Amusing	0.876	0.0216 (-0.0315 to 0.075)	5694	007 (-134 to 282)

**Table 2—Geometric means of standard deviation of responses to each video**

Video	Respiratory exchange ratio	Energy expenditure (kJ/day)
Blank	0.044	465
Pleasant	0.037	324
Exciting	0.057	446
Amusing	0.038	324

## HLA-DR4 and career prospects in rheumatology: is there a link?

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### Abstract

**Objective**—To determine whether HLA type is associated with career progress in rheumatology.

**Design**—Comparison of HLA type after HLA analysis of samples of venous blood.

**Setting**—Department of Rheumatology Research, University of Birmingham.

**Subjects**—All (37) staff in the department.

**Results**—All the senior academics and most staff with a PhD expressed HLA-DR4. The prevalence of expression in each of these groups was significantly greater than that found in the controls. None of the junior doctors or secretaries expressed DR4.

**Conclusion**—The junior doctors in the department have poor career prospects as HLA-DR4 seems to be associated with academic achievement.

### Introduction

The study of the human major histocompatibility complex on chromosome 6 has led to an increased

understanding of the pathogenesis of several diseases. In our department the major histocompatibility complex class II associations of rheumatoid arthritis have been of particular interest.<sup>1,2</sup> HLA typing of new patients presenting with early rheumatoid arthritis is now seen as having an important role in the planning of their management. As part of our research we determined the HLA type of all the members of our department, with some interesting results.

### Methods

In 1992, 38 members of the department of rheumatology gave their informed consent to the taking of an 8 ml sample of venous blood for HLA analysis. We allocated the subjects into five groups: senior academics, staff with a PhD, research workers, junior doctors, and secretaries. We recruited 297 healthy controls. DNA was isolated with phenol extraction, after which we used the polymerase chain reaction to amplify the HLA-DR $\beta$  alleles using standard techniques.<sup>3</sup> We

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